CLAIMS

Please amend the claims as follows:

1. (Withdrawn) A method of determining electromagnetic properties of an inhomogeneous target, comprising:

    a) repeatedly irradiating the target to be imaged with short pulses of electromagnetic energy to induce thermoelastic waves within the target;
    b) detecting mechanical displacements associated with said thermoelastic waves using a magnetic resonance (MR) scanner; and
    c) steps of using the displacements of the thermoelastic waves with a mathematical model to compute the electromagnetic property distribution in said target.

2. (Cancelled)

3. (Withdrawn) The method of claim 1, with further improvement characterized by combining an MR-compatible antenna array to determine electric field values of the inhomogeneous target in the MR environment, and steps of transmitting a microwave signal through an active transmitting antenna, receiving said microwave signal through an active receiving antenna, and using said measured electric field values with a mathematical model to compute an electric property distribution in said target.

4. (Withdrawn) A method of determining electrical properties of an inhomogeneous target in an MR environment, including steps of measuring electric field values external to said target using an antenna array that is MR-compatible, in which an active transmitting antenna transmits a microwave signal, and an active receiving antenna receives said microwave signal, and steps of using said measured electric field values with a mathematical model to compute an electric property distribution in said target, the improvement to compensate for the effect of a non-active antenna of the array on said measured electric field values comprising steps of:

presenting a matched characteristic impedance to a non-active antenna of an antenna array; and

modeling said non-active antenna as an electromagnetic sink in a numerical model.

5. (Withdrawn) The method of claim 4, further characterized in that the frequency of the electromagnetic energy is within the range of 300 MHz to 3 GHz.

6. (Withdrawn) A system for determining electromagnetic properties of an inhomogeneous target, comprising:

(a) a source for repetitively irradiating the inhomogeneous target with short pulses of electromagnetic energy to induce thermoelastic waves within the target; and

(b) a magnetic resonance scanner for detecting the thermoelastic waves.

7. (Withdrawn) The system of claim 6, further characterized in that the frequency of the electromagnetic energy is within the range of 300 MHz to 3 GHz.

8. (Presently Amended) A method for encoding motion within biological tissue comprising:

generating an imaging gradient to encode the harmonic or wave motion within the tissue by simultaneously encoding position and motion, the imaging gradient comprising a positive lobe and a negative lobe; ~~and~~

~~removing any component of the imaging gradient that encodes motion by oscillating at a regular frequency;~~

wherein the positive and negative lobes of the imaging gradient have non-symmetric amplitudes.

9-14. (Cancelled)

15. (Withdrawn) A method of determining electromagnetic properties of an inhomogeneous target, comprising:

(a) repeatedly irradiating the target to be imaged with short pulses of electromagnetic energy to induce thermoelastic waves within the target;

(b) generating an imaging gradient to encode harmonic or wave motion within the target by simultaneously encoding position and motion;

(c) detecting mechanical displacements associated with said thermoelastic waves using a magnetic resonance (MR) scanner;

(d) transmitting a microwave signal through an active transmitting antenna;

(e) receiving said microwave signal through an active receiving antenna;

(f) determining a difference between the transmitted microwave signal and the received microwave signal, the difference corresponding to a measured electric field value of the tissue; and

(g) using the mechanical displacements of said thermoelastic waves and the measured electric field values with a mathematical model to compute the electromagnetic property distribution in said target.

16. (Previously Presented) The method of claim 8, wherein the imaging gradient is a frequency encoding gradient, a phase encoding gradient or a slice selection gradient.

17. (Previously Presented) The method of claim 8, wherein the step of generating the imaging gradient is repeated with the sign of the imaging gradient inverted.

18. (Previously Presented) The method of claim 17, further comprising:

obtaining a first signal and a second signal each containing data indicative of sensed motion, the first signal based on the imaging gradient and the second signal based on the inverted imaging gradient; and

subtracting phase of the first signal from phase of the second signal to provide a total signal indicative of the sensed motion.

19. (Previously Presented) The method of claim 18, wherein the sensed motion is determined in each of multiple directions.

20. (Previously Presented) The method of claim 8, wherein the imaging gradient consists of a positive lobe and a negative lobe.

21. (Cancelled)

22. (Currently Amended) In a magnetic resonance elastography pulse sequence for encoding position and motion of spins in a specimen, an improvement comprising <u>an imaging gradient comprising a positive lobe and a negative lobe, the positive and negative lobes of the imaging gradient having non-symmetric amplitudes</u> ~~absence of a gradient component that oscillates at a regular frequency~~.

23. (New) The method of claim 8, wherein the harmonic or wave motion within the tissue is induced by repeatedly irradiating the target to be imaged with short pulses of high intensity microwave energy from at least one transmitting antenna.

24. (New) The method of claim 23, further comprising detecting mechanical displacements associated with the harmonic or wave motion using a magnetic resonance (MR) scanner.

25. (New) The method of claim 24, wherein the biological tissue comprises a human breast.

26. (New) The method of claim 25, wherein the microwave energy is coupled into the biological tissue through a fluid comprising from seventy to ninety percent glycerin.

27. (New) The method of claim 8, further comprising detecting mechanical displacements associated with the harmonic or wave motion using a magnetic resonance (MR) scanner.

28. (New) The method of claim 24 wherein the step of detecting mechanical displacements comprises, for a plurality of selection gradients:

generating a first imaging gradient to simultaneously encode position and motion;

observing a first phase of magnetic resonance response of the target;

generating a second imaging gradient to simultaneously encode position and motion, the second imaging gradient inverted with respect to the first imaging gradient;

observing a second phase of magnetic resonance response of the target; and

subtracting the first and second phase of the magnetic resonance responses of the target to provide an indicator of mechanical displacements in the target.